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ABSTRACT

This study was accomplished at the request of the Joint Chiefs of Staff, Director for Logistics (J-4). The study is one part of a three part effort to review the annual Defense Industry Studies (DIS) of the Industrial College of the Armed Forces (ICAF). This study examines five industries: Combat Vehicles, Automated Manufacturing, Armaments, Shipbuilding, and Telecommunications-Information Systems. The DIS reports for 1991, 1990, 1989, 1988, and 1980 were reviewed. The study includes the thrust of the DIS reports, observations on each of the five industries, recurring recommendations, and recommended actions to resolve identified deficiencies and ensure these industries maintain the capability to support the national security needs of the United States.

1992
Executive Research Project
SP4 -2

Policy Recommendations to Improve Selected American Industrial Base Capabilities

Lieutenant Colonel
John T. Revelle
U.S. Army

Faculty Research Advisor
Dr. James T. Currie

The Industrial College of the Armed Forces
National Defense University
Fort McNair, Washington, D.C. 20319-6000

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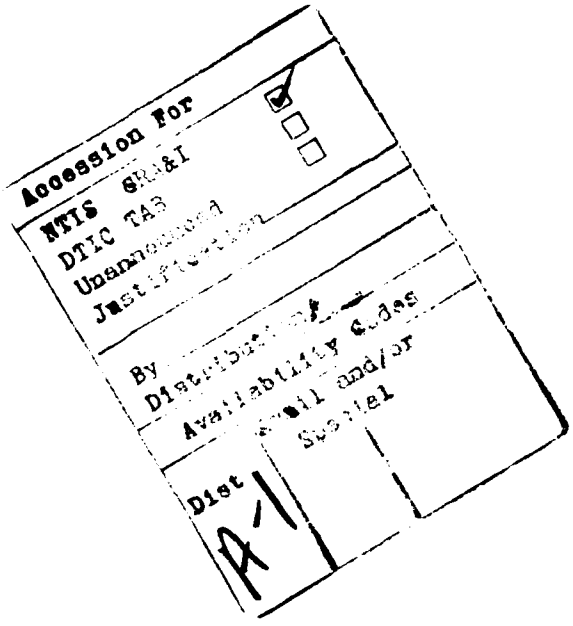

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I EXECUTIVE SUMMARY

Industrial Base Preparedness as the United States (U.S.) has approached it since World War II **must change.** There are three primary reasons. First, the world has changed and threats to national security are significantly different than they were just two years ago when the fall of the Berlin Wall symbolized the end of the Cold War. Second, technology and industry are changing. New materials and new manufacturing processes are creating obsolescence at a rapid pace. Third, the U.S. government cannot spend the amount of money on defense today that it spent defeating the "Evil Empire" in the 1980s.

This paper identifies recommendations that will help maintain a viable industrial base capability **for** these selected industries: **Combat Vehicles, Armaments, Automated Manufacturing, Shipbuilding, and Telecommunications/Information Systems.**

The capacity of U.S. industry to produce defense products is an integral part of our overall industrial capability. There is little reason today to attempt to distinguish the defense base from the whole. However, **the defense market is often different from the commercial markets.** The nature of this market and how the firms compete for work does affect how business should be conducted. Today the defense market is generally characterized by a small number of firms competing for a limited amount of production on a project with relatively high technical risk.

Seeking maximum competition or the cheapest price often suboptimizes total system results. Tomorrow's acquisition strategy must emphasize basic research, encourage innovation, and seek process improvement while controlling costs. The cost of a wrong guess in the light of present uncertainty is too high. [1] A very large number of sophisticated weapons systems remain in the world. Many of these are changing hands at this time. It is impossible to accurately predict where they may begin to concentrate and become a threat to the western world.

The Combat Vehicles industry in the U.S. is declining. The government must change the way it conducts business with this segment if the capability is to be retained. The industry can be maintained at an acceptable cost.

The Armaments industry in the U.S. is declining and will continue to decline. The government will be required to assume more of the cost of capital to keep this capability. Environmental issues may jeopardize production funding of armaments. This industry can be maintained at an acceptable cost, assuming that environmental costs are not unexpectedly increased.

Automated Manufacturing is composed of machine tools, automated manufacturing technologies/equipment (AMT/AME) and flexible manufacturing systems. The **machine tools segment** is the heart of industrial production and the U.S. share of this market **is**

declining. The **U.S. leads the world in AMT/AME technology** and is very competitive internationally. **Flexible manufacturing systems** is an infant segment that is yet to show its growth potential. **The U.S. is fighting to lead** this segment. This industry will be maintained but may require some investment in machine tools.

The Shipbuilding industry in the U.S. may not survive. The government will have to invest in this capability to retain it; however, there are indications that the industry could return to profitability and be competitive internationally.

The Telecommunication/Information Systems industry in the U.S. is strong and dominant in international competition. The government will not have to invest in this capability but will have to update the way it acquires this capability.

The government in the past has relied on the "free market" to guide U.S. industrial base investment. **There is no true "free market."** The government can no longer ignore the fact that other nations are acting boldly to improve their industrial capability. Traditionally, the U.S. has attempted to preserve certain critical capabilities by "mothballing" their entire manufacturing complex. Ammunition plants, tank plants, shipyards, and computer systems are examples. There are at least two explicit drawbacks to this approach. First, it is expensive. Second, it will probably lock us into obsolete technology in the future.

The country needs a broad macroeconomic strategy to ensure that the U.S. is a major economic power in the future. One subset of this strategy should be a National Industrial Policy strategy which provides a frame work for mobilization planning to ramp-up to meet a contingency or begin the reconstitution of combat forces. The objectives of this policy should be to maintain our industrial capability by: developing quality management programs; transferring skills; promoting technical education; engineering new manufacturing techniques; preserving elements of the defense industrial base; and changing acquisition policies. The new acquisition strategy must be capable of taking off-the-shelf prototype systems and putting them into production for reconstitution of either a newly generated unit or a replacement unit. This presupposes that **the Department of Defense (DOD) must acquire sufficient quantities of weapons systems to meet wartime requirements for a short war.**

"A speedy victory is the main object in war."

Sun Tzu [2]

II BACKGROUND

Each year the Industrial College of the Armed Forces (ICAF) conducts defense industry studies that examine the health of fifteen or sixteen critical industries and their industrial base supporting U.S. national security. These reports are published and circulated throughout the government and industry.

In the fall of 1991 the Director for Logistics, Office of the Joint Chiefs of Staff sponsored a project to identify policy options to strengthen the industrial base. This paper is the result of one portion of that project and reviews defense industry studies for 1991, 1990, 1989, 1988, and 1980 examining five industries:

Combat Vehicles (Land Vehicles)

Armaments (Propellants and Charges)

Automated Manufacturing (Machine Tools)

Shipbuilding

Telecommunications & Information Systems (Computers and Command, Control, Communications & Intelligence (C3I))

Past recommendations are reviewed in appendices A through E. Recurring recommendations in each industry are identified in Chapter III. The results of this review are then compared with current industry positions in Chapter IV and government policies in Chapter V. Conclusions derived from analysis, given current world, political and budget considerations, are drawn in Chapter

VI. Recommendations common to more than one industry and essential for national security are highlighted in Chapter VII.

The years reviewed were deliberately selected to show recent trends and provide a historical perspective by going back to the transition year from Democratic to Republican leadership before the big defense buildup beginning in the early 1980s. The world was different then, but many observations are relevant today. **Here are some valuable observations from the "Defense Industry Study Summary 1980."**

"Despite the effects of various national subsidy programs of the principle maritime nations, shipbuilding is by nature a single worldwide market. In this market, which is now characterized by excess capacity, U.S. shipbuilders are not competitive because of relatively high labor costs, financial pressures resulting from high inflation, declining employment, and a lack of a positive U.S. national maritime policy....Thus, while U.S. ocean trade continues to increase, the maritime and related industries continue to decline." [3]

"The brief look at the munitions production complex left our study group with the view that the munitions production industry is generally in good health. But this view should not be construed to mean that problems do not exist. Rather, it is an acknowledgement that problems have been identified and, given the

availability of required resources....solutions are possible." [4]

"There has been no preparedness planning by [the tracked vehicle/automotive] industry, the government hasn't coordinated it, and the Congress hasn't funded it. The stockpiling of components is nonexistent, and there is no plan to keep any closed down production line at least slightly warm. The same can be said for ensuring that a trained cadre of the work force will remain to train the additional manpower that will be necessary for surge. None of the companies we visited have any idea if any work force will be exempt from call-up in the event of mobilization. Even the unions haven't touched the problem." [5]

"The machine tool industry is currently at near capacity production levels. Unfilled order backlogs of from one to four years presently exist, but there are precious few plans for plant expansion due to the extreme conservatism within the industry and the highly capital intensive nature of the industry. The three major factors detracting from the industry's ability to mobilize are lack of plant capacity, lack of a reserve of skilled personnel, and lack of coherent guidance from government. The inability of the [industry] to meet current needs...is a clear signal that the industry could not meet the demands of a national emergency. This situation is not in the national interests." [6]

"The federal government is neither a large nor favored customer

of the [computer] industry. However the computer industry is critically important to the federal government and DoD." [7] "Deregulation [of the telecommunications industry] would lead to decreased interconnectivity and interoperability, and has already discouraged non-cost-competitive back-up and survival features. For example AT&T has proposed a fibre optic link between Washington, D.C. and New York City which will not contain hardening features installed in their past systems." [8] "As a whole, the telecommunications industry has only limited surge capacity." [9]

Obviously, not all observations were correct; however, the bottom line from **the 1980 report identified over-regulation and a lack of planning as the most serious U.S. industrial base issues.**

III ICAF OBSERVATIONS - Recurring Recommendations

The Defense Industry Study groups of the Industrial College of the Armed Forces make recommendations in each year's report. Detailed recommendations are contained in the appendixes of this paper. In some instances in this paper these recommendations were rephrased in order to stand alone. The following paragraphs identify the recurring recommendations for each industry.

A. Combat Vehicles

1. The U.S. needs a mobilization plan in which DOD provides guidance and coordination, Congress provides funding, and industry develops detailed plans.

2. Congress needs to provide limited funding to support mobilization planning and industrial base preparedness.

3. The U.S. government needs to reevaluate the competition in contracting philosophy and determine what type of competition is best suited to the oligarchy/monopsony environment of the market.

4. The DOD needs to determine the time lag to start a cold tank production line. There is a perception that a healthy automotive industry with excess truck capacity will translate directly into increased industrial preparedness for combat vehicles. This may no longer be true.

5. It was interesting to note that foreign military sales (FMS) were not mentioned in report recommendations.

B. Armaments

1. The single most clearly stated recommendation was to rationalize requirements determination. Wide requirements fluctuations from one year to the next significantly degraded both government and industry efforts to improve this sector.

2. Stabilize budget projections by stabilizing requirements, using multi-year contracting, and increasing weapons standardization among the services.

3. Stockpile critical repair parts that are not domestically produced.

4. Change DOD policy:

a. Allow "third party" commercial work to fully utilize equipment and personnel.

b. Balance cost and risk between the government and industry by long term resource commitments in research and development (R&D).

c. Review competition requirements and objectives.

d. Implement mobilization planning using Graduated Mobilization Response (GMR).

5. Facilitate Foreign Military Sales (FMS) by reducing fees and streamlining procedures. The first step in reducing fees is to eliminate the provision to recoup nonrecurring costs in mature systems.

6. Fund environmental clean-up separately from funding for production.

7. Institute tax credits to encourage investment in capital

equipment.

8. Develop procedures to maintain a skilled cadre of workers. Adequate direct labor is generally available; however, in the armaments industry there are shortages of machinists, tool and die makers, engineers, metallurgists and managers with the requisite knowledge about safety, security and environmental requirements.

9. Improve the economic performance of the nation and strengthen the entire industrial base. Enhance alliance interdependence and resist isolationism. Increase national intelligence efforts focused on other nations' industrial capacity and technology. Encourage the implementation of automated manufacturing technologies and flexible manufacturing systems across/throughout domestic industry.

C. Automated Manufacturing

1. Establish a stable fiscal/monetary climate for U.S. industry.

2. Upgrade education and technical training for automated manufacturing technologies (AMT).

3. Foster expanded research and development and create a consortium to coordinate the efforts of government, industry and associations. Continue government support to the National Center for Manufacturing Sciences.

4. Implement policies to share risk between government and

industry by amending antitrust legislation to allow cooperative development projects, cooperative R&D, and the development of international trade and investment strategy.

5. Ensure international competitiveness and stop the decline of the manufacturing sector by encouraging the use of AMT across all U.S. industry.

6. Reinstate tax credits, increase depreciation schedules, and provide low interest loans for the purchase, lease, or refurbishment of capital equipment.

7. Change generally accepted accounting standards and cost accounting standards to meet modern process reality.

8. Develop a National Strategic Technical Policy, a National Industrial Policy Strategy, and a national trend to implement AMT across all U.S. industry.

9. DOD champion concept of "just in time" inventory of [war reserve materiel] WRM critical spares by AME.

10. Streamline contracting procedures.

D. Shipbuilding

1. Preserve the U.S. shipbuilding industry.

2. Create free and fair global markets by negotiating away foreign subsidies and/or imposing economic sanctions.

3. Develop a formal U.S. maritime policy.

4. Promote R&D and establish a research consortium.

5. Expand foreign military sales (FMS).

6. Relax antitrust legislation to allow cooperative

production and data interchange.

7. Construct additional sealift.

8. Change acquisition policies:

a. Expand multi-year contracts.

b. Reduce direct competition between government and industry.

c. Expand commercial specifications.

E. Telecommunications/Information Systems

1. Implement the vision to view entire information systems and total solutions, not hardware, software and communications.

2. Improve requirements determination, utilize industry standards, and identify international interdependencies.

3. Government invest in basic research to ensure national security capabilities are being pursued.

4. Invest in infrastructure by supporting fiber optic networks nationwide.

5. Improve U.S. satellite communications capabilities.

6. Improve communications/data security.

7. Improve education opportunities for technicians and managers.

8. Encourage capital investment by updating tax policies.

9. Simplify and streamline the procurement process.

10. Develop detailed national mobilization requirements.

IV INDUSTRY OBSERVATIONS

1. Combat Vehicles. There is truth in the old phrase, "What's good for General Motors is good for America." **The American automobile industry keeps U.S. industrial production alive and, therefore, keeps the U.S. industrial base alive.** In 1989 the U.S. automobile industry made up about 4% of Gross National Product (GNP), paid $3.76 billion in wages to 843,000 workers and was the single largest consumer of domestic produced plastics, steel and machine tools. [10] The automobile industry serves global markets with intense international competition. U.S. auto makers have just completed their worst year in history by posting gigantic losses. U.S. firms continue to lcse, and Japanese firms continue to gain market share. The health of the entire U.S. economy is tied to the industry. In the past the military vehicles and combat vehicles industry was considered a part of the automotive industry. Today, while it is related, it is distinct and different. Over the past decade the U.S. "Big 3" auto makers have gotten out of the defense specific market. **It is difficult to convert from commercial to military vehicle production.** It is expensive to maintain capabilities. For example, low rate production of the M-1 Abrams tank will allow the continued production of special armor and would be supported by foreign military sales, but closure of the plant will cost $1 billion and require 6 years to start up again later.[11] Private industry is reluctant to invest in low volume defense production.

FY92 estimated total obligation authority (TOA) for procurement dollars is $839.1 M which is 34% of FY90 TOA. [12] A small number of companies compete for a shrinking market and inevitably will become smaller. Currently, the top four companies provide 90% of DOD combat vehicle purchases.[13]

2. **Armaments.** This industry depends upon DOD for most of its business. Estimated TOA for FY92 procurement is $1,249.8 M which is 66% of FY90 TOA. [14] **Major businesses are diversifying.** Safety, security, and environmental considerations increasingly take management and resourcing priority. Once again, there is not a smooth transition from commercial to government production. There are more contractor owned and contractor operated (COCO) plants but all of these have a high percentage of government furnished equipment (GFE). The eight active and eleven inactive government owned and contractor operated (GOCO) plants have low production and low capital investment in modern equipment. The few government owned, government operated (GOGO) plants specialize in unique capabilities like cannon production and chemical production.

3. **Automated Manufacturing. The industry is composed of three segments: machine tools, automated manufacturing technology/equipment and flexible manufacturing systems.** Machine tools are basic to industrial production and essential to combat vehicle production. The U.S. lost world domination of the

industry in the 1980s. As the world market increased by 20% the U.S. share decreased by 25%. [15] While the traditional machine tools industry has waned, automated manufacturing has experienced explosive growth. The production of automated manufacturing equipment is at capacity in the U.S., Japan and Germany. Lead times of 18-24 months for orders is not unusual. The production of robotics is expanding. Flexible manufacturing systems are growing slowly with U.S. firms very competitive internationally. **The industry is hampered by a lack of standards and untrainable apprentices.** It is observed that numerous workers have neither the reading nor mathematical skills to learn industry processes.

4. **Shipbuilding. The industry is rapidly deteriorating and its viability is in question.** Estimated TOA for FY92 procurement is $8,647.2 M which is 75% of FY90 TOA. It will barely keep up with maintenance requirements. The two major U.S. flag commercial carriers have announced that without government incentives they will re-flag their fleets within the next few years. The government must decide whether to maintain this industry or let it migrate. Most nations subsidize their shipbuilding industry. Japan and Korea concentrate their building in simple ships like large tankers and container ships. The Europeans specialize in unique, complex ships like cruise ships, liquid gas carriers and war ships. **The U.S. has the potential to regain commercial work in specialty ships** because of competitive labor rates, high

quality, declining subsidies elsewhere, superior management and the favorable exchange rate of the dollar.

5. Telecommunications/Information Systems. The industry continues to change dynamically. **Emphasis is moving away from hardware, software and communications capabilities to total systems solutions.** Artificial intelligence initiatives are growing. The U.S. is competitive primarily based on reliability and cost. The expansion of fiber media networks and satellite based communications continues at a rapid pace. **Continued technological superiority is the key to U.S. competitiveness.** The lead we hold in software development must be maintained and exploited. Hardware will continue to get smaller and faster. Voice processing/recognition will continue to receive significant effort. Automation and communications security development is lagging behind expectations. Obsolete technology is being replaced at a rapid rate. The federal acquisition cycle is longer than the product life cycle in most cases.

V POLICY OBSERVATIONS

The U.S. is the only major industrial country without a national industrial policy/strategy. The DOD approach is hands-off...let the "free market" work. The government and industry need a road map to remain competitive. The U.S. is relying on the "invisible hand" of the "free market" to define economic and industrial policy. **This is wrong because there is no "free market,"** and the other industrial nations of the world have their hands visibly in the market. **In a competitive world influenced by government actions, it is rational to establish industrial policies and strategies.** This is not part of a planned central economy. It is good business. No business survives without a business plan that defines desired outcomes. Today government is business...big business. Smart businessmen set goals, establish policies and develop strategies to succeed. Many U.S. businessmen today believe we need a national industrial strategy that addresses:

a. Coordinated research and development activities between government and industry.

b. Maintenance of a "warm base" for critical weapons systems like tanks and submarines.

c. Independence from reliance on "foreign sourced" components of major weapons systems like the fire control system on the M-1 Abrams tank.

d. Development of national production technologies to keep

the American manufacturing industry competitive.

e. National emphasis on education that focuses on the basics of reading, writing, mathematics and science.

f. Identification of "triggers" for Graduated Mobilization Response.

g. Development of the Defense Critical Technologies Plan.

h. Strategies for conversion from defense to commercial production with the capability to convert back.

i. Other potential elements of a national industrial strategy include quality management programs, stockpiling critical materials, and changing acquisition policies and procedures.

The National Military Strategy identifies the need to activate the industrial base on a large scale for reconstitution.[16] "DOD believes that the industrial base will be capable of meeting national security requirements as the new defense environment takes hold."[17] Many industrial base programs are good; however, taken together, they do not make-up a comprehensive response to defense industrial base problems that are getting worse.[18]

The adversarial relationship between government and industry works in neither's favor. Industry is in business to make a profit. The government exists to protect and order society. These are not conflicting roles. Increased trust between them is the first step necessary to begin the process of simplifying the

bureaucracy.

Streamlining the acquisition process will reduce government costs and encourage industry to focus on providing government needs.

a. Government cost accounting standards differ from generally accepted commercial accounting standards and place a burden on industry. This increases the cost of government items while impeding industry's ability to sell to both the government and commercial markets.

b. The Truth in Negotiations Act creates an unnecessary adversarial relationship between contractors and the government.

c. Unnecessary contract requirements, like many military specifications (MILSPECS), increase contract costs and preclude the use of state-of-the-art technologies.

d. Government demands for technical data packages should be carefully questioned. Often they significantly increase contract costs, impede timely contract changes and are used against the good faith contractor when the item is recompeted.

The annual appropriations process is a structural inhibitor of efficient government-industry relations. Widely fluctuating authorizations drive costs up. Sound, conservative POM projections accompanied by multi-year contracts save money. They allow better management, more orderly sub-tier contracting and less workforce turbulence.

Tax laws do not provide incentives for capital investment. A reduction in the capital gains tax for the purchase, rebuild, or lease of plant or equipment will encourage investment. An accelerated depreciation schedule will result in earlier replacement of equipment with newer technology. Personal incentives to save will make more capital available at reasonable interest rates for investment.

Education is critical to prosperity. While the U.S. has talked about education over the past decade it has achieved little in improving education excellence. In these times of budget shortfalls, additional resources will be scarce. However, excellence can be achieved by focusing on basics: reading, writing, mathematics, and science.

VI CONCLUSIONS

A strong, stable, growing domestic economy is the foundation upon which U.S. national security will rest in the future. With the end of the Cold War the economic and political elements of power now are dominant over military power. The government must foster an environment that promotes production, supports domestic economic activity, and encourages the removal of barriers to international trade.

America lost dominance in the machine tools industry because foreign products were readily available, delivered on time, cost less and had excellent support. Yet these are the same characteristics that have kept U.S. software development in a world leadership position. In the long run the production of quality products creates economic excellence.

American industry is living off foreign talent in science and mathematics. Education improvements will come from three basic areas. First, the schools will be forced back to basic: discipline, reading, writing, mathematics. Second, government will provide incentives for critical skills, like science and math. Third, industry will continue and expand support for needed skills at the community level.

The new acquisition strategy will slow research and development

at a time when R&D is essential as we move into composite vehicles, ceramic engines and new processes based on computer aided design/manufacturing (CAD/CAM) and sequential engineering. These initiatives will improved with implementation of special purpose manufacturing and flexible design systems used to produce multi-year contracts, often in government owned and contractor operated (GOCO) facilities. No surge or mobilization capacity will exist beyond current excess capacity.

Continued modernization of U.S. weapons systems is essential to continued technological supremacy...sustainment of current capabilities is actually retreat. Cooperative development and production with allies is essential to the viability of the long term health of the combat vehicle, armaments, and shipbuilding industries in the U.S.

Expansion of Foreign Military Sales (FMS) expands markets and increases production runs, lowering costs. More importantly, it puts first class weapons systems in allies hands reducing the probability that U.S. forces will be committed. Unfortunately, the realignment of the "new world order" is such that customers may, in fact, not be allies. FMS then becomes a risk.

In this period of decreased threat and defense budgets, the nation's senior leadership must understand our situation and provide the vision of active leadership to improve our economy.

VII RECOMMENDATIONS

1. Develop a National Industrial Policy strategy.

2. DOD should lead the effort to improve mobilization planning using the Graduated Mobilization Response (GMR) concept.

3. Review the competition in contracting policies to determine the appropriate/proper focus for the existing market.

4. DOD should improve contracting procedures.

5. DOD should improve requirements determination.

6. DOD should stabilize budget projections by:

   a. Use of multi-year contracting.

   b. Utilizing foreign military sales (FMS) to smooth and support production schedules.

   c. Balance government/industry cost/risk sharing.

7. Change tax laws to:

   a. Allow tax credits for capital investments.

   b. Allow rapid depreciation of new or remodeled equipment.

8. Upgrade technical training and education for U.S. industry skills.

9. Foster increased research and development.

10. Improve the U.S. economy strengthening industrial capability by amending anti-trust legislation to allow more cooperative ventures and vigorously pursuing the General Agreement on Trade and Tariffs (GATT).

"Stability of funding, schedules, goals and people is critical to any smooth business operation. Conversely, turbulence produces work disruption, increases cost, generates delays, deters investment, diverts management attention, undermines accountability, and demotivates employees."

Norman R. Augustine [19]

APPENDIX A

COMBAT VEHICLES

1991 Land Vehicles[20]

1. Maintain high levels of R&D to keep engineering and technology development alive.
2. Consider the development of policy revisions to further incentivize investments by defense contractors in new plant production equipment.
3. Separate mobilization costs from programs. Place mobilization decisions back in the political arena. Maintaining unused capacity only creates competition for limited government resources and contributes to adversarial relationships among DOD, Congress and contractors.
4. Let economics resolve market competition. Long but uneconomical production runs are not in our best interest. Buy the inventory at best value. Build production plants if necessary for each generation of equipment.

1990 Land Vehicles[21]

1. Eliminate the current adversarial relationship that exists between government, labor and industry.
2. Revise laws to allow and encourage intra-U.S. joint ventures.
3. Open Japanese and European markets to U.S. manufacturers.
4. Support dual-use technologies.
5. Support and fund national capability to manufacture combat

vehicles.

1989 Global Military Land Vehicles[22]

1. The U.S. has an uncoordinated industrial policy.

2. The nation must have a solid policy formulation by the President and political and funding support by the Congress.

3. Collecting and analyzing the origin of factors of production should be a major priority for DOD and NATO. The Congress, OSD, and industry should consider the advantages of increased use of commercial vehicle production lines to simultaneously fabricate military vehicles.

4. Fund for manufacturing engineering improvements in initial contracts.

1988[23]

1. Mobilization planning is virtually nonexistent.

2. DOD is not willing to commit enough resources in peacetime to ensure sufficient mobilization capacity exists.

3. DOD must enhance efforts to "buy before the war starts."

4. DOD must examine the impact of the Competition Advocates on the U.S. industrial base and mobilization capability.

5. Excess truck production exists; however, tank production is extremely limited.

6. U.S. land vehicle industry must focus on long term competition.

7. The U.S. strategy to achieve world class status again is

through automation, especially, flexible manufacturing.

1980[24]

1. Congress fund, DOD coordinate, and industry develop an industrial preparedness plan.

2. Develop a plan to manage the transfer of tank production to another firm if Chrysler fails.

3. Determine how to meet M113 surge requirements until XM2/3 are in production.

4. Determine whether we will sell XM1 or M60A3 in FMS to determine production line requirements.

APPENDIX B

ARMAMENTS

1991[25]

1. Determine armaments requirements based on the changing threat and develop a coherent policy with supporting plans and programs.

- Achieve a stable budget using multi-year contracts.
- Prepare risk assessments for strategic scenarios.
- Determine what can be accomplished in current economics.
- Employ graduated mobilization response.
- Recognize that all items cannot be produced instantly.

2. Change mobilization policy.

- Strengthen the entire industrial base, not just defense.
- Improve general economic conditions within the U.S.
- Enhance alliance interdependence and resist isolationism.
- Produce what we're good at, not every item in inventory.
- Enhance national intelligence efforts.
- Concentrate on acceleration/surge capability of existing production lines.
- Reduce the number of critical end items.
- Maintain warm production base using multi-year contracts
- Modernize via product improvements vice new weapons.
- Divest majority of government owned facilities and equipment, keeping only propellent and explosive facilities and gun tube production.

-Maintain sufficient stockpiles of weapons and repair parts

to meet short high-intensity war requirements.

3. Emphasize direct "third party" commercial work to utilize idle plant equipment and maintain production cadre.

4. Foster cooperative projects with foreign sources and provide long term investment incentives for domestic producers through multi-years contracts and reduced program turbulence.

5. Recognize world-wide interdependence and stockpile critical repair parts from unstable or unreliable sources for a short war.

6. Facilitate foreign military sales (FMS).

7. Fund environmental clean-up without offsetting armament budget reductions.

1990[26]

1. Determine armaments requirements.

- Coordinate policies regarding short war/long war, strategic warning and force sustainability.

- Mobilization plans are required for implementing graduated mobilization response.

2. DOD make a meaningful long-term resource commitment to modernize and maintain in peacetime the industrial base.

- Modify facilitization policies to allow industry to recoup investments.

- Encourage civilian investments (tax credits) in dual-use (commercial/military) plant and equipment.

- Spend more on industrial base prep and maintenance.

- Fund appropriate surge and mobilization planning within

industry.

3. Allow more direct "third party" commercial work at GOGO/GOCOs to utilize idle plant equipment and maintain cadre.

4. Reduce program turbulence and increase multi-year contracting.

5. Change implementation of CICA to help reduce dependency on offshore sources.

6. Stockpile critical repair parts with unstable overseas dependency.

7. Facilitate FMS by reducing fees and streamlining approval process.

8. Separately fund environmental cleanup without offsetting budget reductions.

9. Investigate programs to assist U.S. companies train and maintain a cadre of skilled workmen for a robust mobilization base.

1989[27]

1. DOD must lead in reestablishing a strong industrial base.

- Establish concrete near, mid and long range industrial policy plans.

- Balance government and industry sharing of risks and costs.

2. DOD must be willing to fund for surge and mobilization preparedness.

3. Congress should reduce the cost of doing business with DOD.

- Modest deregulation in peacetime, including modification of the CICA requirements.

- Establish selective incentives for domestic armament contractors who are disadvantaged in globally competitive defense critical markets.

4. DOD conduct an industrial base vulnerability analysis of its major armament weapons systems.

5. DOD develop mobilization plans employing graduated mobilization response.

6. Congress fund environmental cleanup of DOD facilities.

7. Legislate personal liability protection for government employees.

8. To fund a sound armaments industry, DOD must:

- Cancel some weapons systems,
- Eliminate uneconomical facilities/lines,
- Increase weapons standardization among the services,
- Institute multi-year procurement budgets.

1988[28]

1. Government and industry must cooperate to improve the armaments industry.

- Streamline the acquisition process.
- Balance cost and risk sharing.

2. Surge and mobilization capabilities must be enhanced.

- Stockpile critical materials.
- Automated and flexible manufacturing systems need to be

implemented.

- Sound planning must identify trade-offs between "smart weapons" and the funding of the mobilization base.

1980 Munitions and Propellants/Chemical[29]

1. Stabilize requirements.
2. Revise Industrial Preparedness Planning assumptions.
   - Funding for construction, modernization and maintenance.
   - Time and availability of centrally procured metal components.
3. Determine difficulty of restarting productions lines.
   - Computer logic operated equipment.
   - Skilled personnel.

APPENDIX C

AUTOMATED MANUFACTURING

1991[30]

1. Answer these defense policy questions:
   - What does defense industry need to manufacture?
   - What critical technologies are required?
   - How much risk is acceptable with off-shore producers?
   - How much freedom can the defense industry be given and still maintain the public trust?
   - What are the costs and technology tradeoffs?
2. Establish a stable fiscal/monetary climate conducive to economic growth.
3. Institute a regulatory environment that balances industrial growth with social/environmental principles.
4. Improve the financial environment.
5. Upgrade education and technical training.
6. Diffuse manufacturing technologies.
7. Foster research in commercially significant technologies.
8. Prioritize programs within a phased plan for retooling the American manufacturing base.
9. Develop a National Strategic Technology Policy immediately.
   - Integrate the technology selection process immediately.
   - Transition the R&D emphasis to manufacturing process and applications.
   - Use the R&D consortia as the principle research

mechanism.

- Re-evaluate the use of international collaboration.
- Use DOD as the coordinating agency on an interim basis.
- Fund manufacturing R&D and modernization programs.

10. Encourage industry participation in selecting and planning R&D projects and share risk between government and industry.

11. Ensure global competitiveness by stopping the decline of the entire manufacturing sector.

12. Bolster manufacturing productivity by increased R&D investment.

13. Select strategic investments for federal participation in R&D and international collaborative efforts.

1990[31]

1. Encourage the increased use of automated manufacturing technologies (AMT) across all domestic industry.

2. Reinstate investment tax credits for productivity enhancement projects.

3. Allow investments in productivity enhancing equipment to be depreciated over its technologically useful life.

4. Provide favorable tax treatment for leased AMT as well.

5. Promote changes in generally accepted accounting principles and cost accounting standards that recognize the changing character of world class manufacturing, like "Activity Based Accounting."

6. Expand the Commerce Departments technology transfer efforts

to reach a wider audience and establish a clearinghouse for implementing strategies.

7. Amend antitrust laws to permit cooperative product development, cooperative R&D, and coordination of corporate international trade and investment strategies. Offer low interest loans to manufacturing companies to acquire flexible manufacturing technologies that would be available to DOD during mobilization.

8. Provide favorable tax treatment for industrial base recapitalization.

9. Develop a national industrial policy strategy.

1989[32]

1. Change the tax regulations.

- Reinstitute the Investment Tax Credit and the Accelerated Depreciation Schedule. Limit the credit to new or refurbished equipment.

- Establish tax credits for training or retraining workers to utilize automated manufacturing equipment.

- Increase corporate tax rates for short term profits and decrease the tax rate for long term gains.

- Institute a tax credit for demonstrated investments in manufacturing and materials research and development.

2. Change corporate financial incentives.

- Provide low cost loans for investment in manufacturing automation used to produce weapons related products.

- Increase direct government contracts for advanced manufacturing equipment and processes.

- Continue government "seed money" support to the National Center for Manufacturing Sciences.

- Revise acquisition regulations to permit reimbursement for productivity enhancing tooling and test equipment.

- Encourage the revision of Cost Accounting Standards to incentivize the acquisition of automation.

3. Improve the training of technicians.

- Assure that vocational education programs are geared to meet the needs of automated manufacturing technicians, especially in mathematics and computers.

- Encourage the development of apprenticeship programs run by industry.

1988[33]

1. Establish low interest loans, investment tax credits, and/or other incentives which encourage investment in capital equipment and research and development.

2. U.S. companies expand their long range business plans to include overseas markets through joint ventures, purchases, distributorships, etc.

3. The industry and government should jointly support research in new technologies, through participation in the National Center for Manufacturing Sciences, the Industrial Technology Institute and other university based "centers of excellence" in machining

and automation.

4. Industry develop strong apprenticeship programs.

5. Have the National Bureau of Standards establish necessary standards.

6. Establish a standardization working group co-chaired by the National Bureau of Standards and the Federal Emergency Management Agency (FEMA) with wide participation by other government agencies, academia, industry associations and societies.

7. DOD should make design for AME--producibility a contract condition for acquisition of major weapons systems and critical component parts.

8. The Services and DLA should seek data rights, digitalized CAD/CAM descriptions, and parts programs for items they manage which are adaptable to AME production. This should be routinely incorporated in the contract data requirements for "new" weapons systems. DOD should champion the concept of "just-in-time" inventories of WRM for critical spare parts which could be manufactured by AME.

9. DOD should identify existing flexible manufacturing systems ... and establish viable procedures to exploit these capabilities when needed for national defense.

10. Commerce and DOD should foster flexible manufacturing into small manufacturing firms.

11. DOD integrate AME production efforts within the government ensuring they compliment industry and assure commonality.

12. DOD should initiate this long-range planning effort to

formulate a strategy to effectively use AME capabilities to meet our defense needs today and tomorrow.

1980 Machine Tools/Industrial Machinery[34]

1. Increase productivity by replacing old machine tools.
2. Train more young machinists and provide more in-house training.
3. Institute tax credits and reduced depreciation schedules to increase capital investment.
4. Department of Commerce push the "trigger order program."
5. Streamline government contract procedures.
6. Purge the general reserve and retain only those items required.
7. Modernize the equipment in the plant equipment packages.
8. Place more of the mobilization burden on the industrial base where it belongs.
9. Reduce the volume of regulations covering exports.

APPENDIX D

SHIPBUILDING

1991[35]

1. Promote a free and fair global market by negotiating away foreign subsidies or imposing economic sanctions against governments like Japan that don't agree.
2. Promote research and development in the shipbuilding industry.
   - Support product and process R&D that will enhance competition.
   - Establish a research consortium to increase productivity and improve competitiveness.
3. Expand Foreign Military Sales (FMS) by relaxing procedures and changing our policy of not exporting submarines.
4. Revise policy regarding industry cooperation by supporting a consortium to team on production and share technology.
5. Construct additional sealift vehicles.
6. Modify government acquisition policies.
   - Expand use of multi-year contracts.
   - Reduce the number of shipyards eligible to compete on government contracts.
   - Expand the use of commercial specifications.
   - Reduce the number of flow down requirements.

1990[36]

1. Increase government support to revive the shipbuilding industry.
2. Expand the Ready Reserve Fleet.
3. Revitalize the flagged merchant marine fleet.

1989[37]

1. Expand the cargo preference or reservation program.
2. Reinstitute the use of construction differential subsidies.
3. Ensure that the provisions of the Merchant Marine Act of 1920 and the Tariff Act of 1930 are properly enforced.
4. Establish a public/private consortium, funded by the government, to perform R&D with maritime applications in both military and commercial areas, as well as limited co-production of prototypes.
5. Change U.S. Navy contracting and operational policies and practices.
   - Expand the use of class maintenance and class overhaul plans and contracts.
   - Explore methods to reduce direct competition between Navy-run and private activities.
   - Develop a more equitable system to level-load repair work in both Navy and private yards.
6. The U.S. needs a formal Maritime policy.

1988[38]

1. Continue to work on the margin to preserve the industry.

2. Rigorously press for equitable economic trading pacts.

3. Congressional passage of the OSD program can improve the competitive position of our merchant marine.

4. The government furnish or capitalize the cost of special tooling required by government contracts.

5. Trade agreements with other nations should be thoroughly reviewed to prevent grossly unfair practices.

6. The decline of the industry will continue, but we can manage it better as a nation.

1980[39]

1. The United States requires a positive, national shipbuilding policy.

2. The size of the Navy should be fixed by Congress.

3. Closer coordination is required among Navy, OSD, OMB, MARAD and Congress to smooth shipbuilding workloads.

4. Congress and the Administration agree to multi-year funding and approve a long-term shipbuilding program for a firm force objective.

APPENDIX E

TELECOMMUNICATIONS/INFORMATION SYSTEMS

1991[40]

1. Think in terms of "information services" rather than hardware, software and communications.
2. Senior leaders must become familiar with the strategic resource of information technology and communicate their vision of its use.
3. Commit to quality management by training government managers in Total Quality Management.
4. Rethink developmental strategies by improving requirements determination and significantly shortening the acquisition process.
5. Recast leadership roles giving government the lead in R&D.
6. Reassess the roles of talented junior officers and empower them to make decisions on developmental strategy.
7. Establish a communications infrastructure based on fiber optics.
8. Improve satellite communications capabilities.
9. Enhance security requirements.
10. Improve education of U.S. high school and college youth.

1990[41]

DOD establish a top level policy to take advantage of the strength of the commercial information industry.

- Focus on total solutions.
- Use of commercial standards and equipment.
- Dynamic replacement of information technology.

1989[42]

1. OSD assign a high priority to the production base analysis of the information systems and telecommunications industry to determine those domestic manufacturing capabilities that are inadequate to meet critical defense mobilization needs and to acquire an understanding of the international interdependencies of the industry.
2. OSD continue to strongly support implementing information system standards that are commercially viable and meet national security requirements.
3. OSD initiate and support a top-down analysis of information systems procurement process to simplify and streamline the policy.
4. OSD review the basic information technology research to ensure that long term national security objectives re addressed.
5. OSD pursue recommendations of the USD(A) in July 1988 to bolster defense industrial competiveness through technical education.

1988[43]

1. Develop and adhere to rigid and demanding standards such as open system interconnection (OSI).

2. Improve the information industries procurement strategies.

3. Security poses serious problems.

4. Expert systems, robotics, etc. are just beginning to sprout into an enormous jumble of activity.

1980 Computers[44]

1. Streamline procurement procedures.

2. Enhance surge capability.

- Update obsolete computers.
- Stockpile unique military parts.
- Explore replacing unique militarized computers with commercially available systems.

3. Encourage federal trade policies more favorable to the U.S. computer industry.

Command, Control and Communications[45]

1. A strong JCS role in PPBS should be supported.

2. Detailed national mobilization requirements should be established.

3. Government should determine requirements and funding mechanisms for adequate levels of basic research.

4. Tax laws should be changed to encourage investment and recognize rapid depreciation.

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